

Release notes for ENDF/B Development n-096\_Cm\_241  
evaluation

**ENDF**  
B-VII.**dev**

April 26, 2017

- fudge-4.0 Warnings:

1. Cross section does not match sum of linked reaction cross sections  
*crossSectionSum label 0: total (Error # 0): CS Sum.*

WARNING: Cross section does not match sum of linked reaction cross sections! Max diff: 0.40%

2. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 1 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'6 delayed'] + gamma [total fission] [nubar]): / Form 'eval': (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

3. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 2 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'6 delayed'] + gamma [total fission] [nubar]): / Form 'eval': (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (2.257479e-09) is too small

4. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 3 (total): / Form 'eval': / Component 0 (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

5. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 3 (total): / Form 'eval': / Component 1 (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

6. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 4 (n + Cm241): / Form 'eval': / Component 0 (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

7. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 4 (n + Cm241): / Form 'eval': / Component 1 (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

8. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 8 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'6 delayed'] + gamma [total fission]): / Form 'eval': / Component 0 (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

9. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 8 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'6 delayed'] + gamma [total fission]): / Form 'eval': / Component 1 (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

10. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 9 (n + (Cm241\_e1 -> Cm241 + gamma)): / Form 'eval': (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (4.421073e-11) is too small

11. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 10 (n + (Cm241\_e2 -> Cm241 + gamma)): / Form 'eval': (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (4.774469e-10) is too small

12. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 11 (n + (Cm241\_e3 -> Cm241 + gamma)): / Form 'eval': (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (4.831656e-09) is too small

13. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 12 (n + (Cm241\_e4 -> Cm241 + gamma)): / Form 'eval': (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (1.573667e-09) is too small

14. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 13 (n + (Cm241\_c -> Cm241 + gamma)): / Form 'eval': (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

15. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 14 (Cm242 + gamma): / Form 'eval': / Component 0 (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

16. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 14 (Cm242 + gamma): / Form 'eval': / Component 1 (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

17. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 15 (n + Cm241 [angular distribution]): / Form 'eval': (Error # 1): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

18. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 16 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'6 delayed'] + gamma [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

19. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 17 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'6 delayed'] + gamma [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

20. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 18 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'6 delayed'] + gamma [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

21. The ratio of smallest/largest eigenvalue is quite small, possibly leading to numerical instability in downstream codes.  
*Section 19 (n[multiplicity:'energyDependent', emissionMode:'prompt'] + n[emissionMode:'6 delayed'] + gamma [total fission] [spectrum]): / Form 'eval': (Error # 0): Condition num.*

WARNING: Ratio of smallest/largest eigenvalue (0.000000e+00) is too small

- fudge-4.0 Errors:

1. ENDF format insists that all outgoing fission neutrons, delayed or otherwise, have spectra. For delayed neutrons this is tough.  
*Reading ENDF file: ../n-096-Cm-241.endf (Error # 0): No delayed n dist*

WARNING: More than one delayed fission neutron decay time but no MF = 5 data

2. Duplicate Eout in outgoing distribution  
*Reading ENDF file: ../n-096-Cm-241.endf (Error # 1): Bad Eout*

WARNING: skipping duplicate e\_out = 6969520.0, i1 = 81 0 1e-05

3. Energy range of data set does not match cross section range  
*reaction label 5: n + (Cm241-c -> Cm241 + gamma) / Product: Cm241-c / Decay product: gamma\_a / Multiplicity: (Error # 0): Domain mismatch (a)*

- WARNING: Domain doesn't match the cross section domain: (120000.0 -> 20000000.0) vs (110922.0 -> 20000000.0)
4. Energy range of data set does not match cross section range  
*reaction label 5:  $n + (Cm241\_c \rightarrow Cm241 + \gamma) / Product: Cm241\_c / Distribution: / uncorrelated - angular - isotropic: (Error \# 0): Domain mismatch (a)$* 

WARNING: Domain doesn't match the cross section domain: (120000.0 -> 20000000.0) vs (110922.0 -> 20000000.0)  
WARNING: Domain doesn't match the cross section domain: (200000.0 -> 20000000.0) vs (110922.0 -> 20000000.0)  
WARNING: Domain doesn't match the cross section domain: (163682.0 -> 20000000.0) vs (110922.0 -> 20000000.0)  
... plus 3 more instances of this message
  5. Energy range of data set does not match cross section range  
*reaction label 5:  $n + (Cm241\_c \rightarrow Cm241 + \gamma) / Product: Cm241\_c / Decay product: gamma\_b / Multiplicity: (Error \# 0): Domain mismatch (a)$* 

WARNING: Domain doesn't match the cross section domain: (200000.0 -> 20000000.0) vs (110922.0 -> 20000000.0)
  6. Energy range of data set does not match cross section range  
*reaction label 5:  $n + (Cm241\_c \rightarrow Cm241 + \gamma) / Product: Cm241\_c / Decay product: gamma\_c / Multiplicity: (Error \# 0): Domain mismatch (a)$* 

WARNING: Domain doesn't match the cross section domain: (163682.0 -> 20000000.0) vs (110922.0 -> 20000000.0)
  7. Energy range of data set does not match cross section range  
*reaction label 5:  $n + (Cm241\_c \rightarrow Cm241 + \gamma) / Product: Cm241\_c / Decay product: gamma\_d / Multiplicity: (Error \# 0): Domain mismatch (a)$* 

WARNING: Domain doesn't match the cross section domain: (163682.0 -> 20000000.0) vs (110922.0 -> 20000000.0)
  8. Energy range of data set does not match cross section range  
*reaction label 5:  $n + (Cm241\_c \rightarrow Cm241 + \gamma) / Product: Cm241\_c / Decay product: gamma\_e / Multiplicity: (Error \# 0): Domain mismatch (a)$* 

WARNING: Domain doesn't match the cross section domain: (200000.0 -> 20000000.0) vs (110922.0 -> 20000000.0)
  9. Energy range of data set does not match cross section range  
*reaction label 5:  $n + (Cm241\_c \rightarrow Cm241 + \gamma) / Product: Cm241\_c / Decay product: gamma\_f / Multiplicity: (Error \# 0): Domain mismatch (a)$* 

WARNING: Domain doesn't match the cross section domain: (300000.0 -> 20000000.0) vs (110922.0 -> 20000000.0)
  10. Energy range of data set does not match cross section range  
*reaction label 5:  $n + (Cm241\_c \rightarrow Cm241 + \gamma) / Product: Cm241\_c / Decay product: gamma\_g / Multiplicity: (Error \# 0): Domain mismatch (a)$* 

WARNING: Domain doesn't match the cross section domain: (300000.0 -> 20000000.0) vs (110922.0 -> 20000000.0)
  11. Calculated and tabulated Q values disagree.  
*reaction label 6:  $n[multiplicity:'2'] + Cm240 + \gamma (Error \# 0): Q mismatch$* 

WARNING: Calculated and tabulated Q-values disagree: -5954330.511810303 eV vs -6093330. eV!
  12. Energy range of data set does not match cross section range  
*reaction label 6:  $n[multiplicity:'2'] + Cm240 + \gamma / Product: gamma\_a / Multiplicity: (Error \# 0): Domain mismatch (a)$*

- WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (6118820.0 -> 20000000.0)
13. Energy range of data set does not match cross section range  
*reaction label 6: n[multiplicity:'2'] + Cm240 + gamma / Product: gamma\_a / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (6118820.0 -> 20000000.0)

  14. Energy range of data set does not match cross section range  
*reaction label 6: n[multiplicity:'2'] + Cm240 + gamma / Product: gamma\_b / Multiplicity: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (6118820.0 -> 20000000.0)

  15. Energy range of data set does not match cross section range  
*reaction label 6: n[multiplicity:'2'] + Cm240 + gamma / Product: gamma\_b / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (6500000.0 -> 20000000.0) vs (6118820.0 -> 20000000.0)

  16. Energy range of data set does not match cross section range  
*reaction label 6: n[multiplicity:'2'] + Cm240 + gamma / Product: gamma\_c / Multiplicity: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (7000000.0 -> 20000000.0) vs (6118820.0 -> 20000000.0)

  17. Energy range of data set does not match cross section range  
*reaction label 6: n[multiplicity:'2'] + Cm240 + gamma / Product: gamma\_c / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (7000000.0 -> 20000000.0) vs (6118820.0 -> 20000000.0)

  18. Energy range of data set does not match cross section range  
*reaction label 6: n[multiplicity:'2'] + Cm240 + gamma / Product: gamma\_d / Multiplicity: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (7000000.0 -> 20000000.0) vs (6118820.0 -> 20000000.0)

  19. Energy range of data set does not match cross section range  
*reaction label 6: n[multiplicity:'2'] + Cm240 + gamma / Product: gamma\_d / Distribution: / uncorrelated - angular - isotropic: (Error # 0): Domain mismatch (a)*

WARNING: Domain doesn't match the cross section domain: (7000000.0 -> 20000000.0) vs (6118820.0 -> 20000000.0)

  20. Calculated and tabulated Q values disagree.  
*reaction label 7: n[multiplicity:'3'] + Cm239 + gamma (Error # 0): Q mismatch*

WARNING: Calculated and tabulated Q-values disagree: -13492331.27111816 eV vs -1.36312e7 eV!

  21. Calculated and tabulated Q values disagree.  
*reaction label 9: Cm242 + gamma (Error # 0): Q mismatch*

WARNING: Calculated and tabulated Q-values disagree: 7108519.551940918 eV vs 6969520. eV!

22. Multiplicity does not match sum of linked product multiplicities!  
*multiplicitySum label 7: n + (Cm241.c -> Cm241 + gamma) total gamma multiplicity*  
*(Error # 0): summedMultiplicityMismatch*
- WARNING: Multiplicity does not match sum of linked product multiplicities! Max diff: 45.83%
23. Multiplicity does not match sum of linked product multiplicities!  
*multiplicitySum label 8: n[multiplicity:'2'] + Cm240 + gamma total gamma multiplicity*  
*(Error # 0): summedMultiplicityMismatch*
- WARNING: Multiplicity does not match sum of linked product multiplicities! Max diff: 100.00%
24. Calculated and tabulated Q values disagree.  
*fissionComponent label 0: /reactionSuite/fissionComponents/fissionComponent[@label='0']*  
*(Error # 0): Q mismatch*
- WARNING: Calculated and tabulated Q-values disagree: 225483473110.4295 eV vs 2.094743e8 eV!
25. Calculated and tabulated Q values disagree.  
*fissionComponent label 1: /reactionSuite/fissionComponents/fissionComponent[@label='1']*  
*(Error # 0): Q mismatch*
- WARNING: Calculated and tabulated Q-values disagree: 225483473110.4295 eV vs 2.094743e8 eV!
26. Calculated and tabulated Q values disagree.  
*fissionComponent label 2: /reactionSuite/fissionComponents/fissionComponent[@label='2']*  
*(Error # 0): Q mismatch*
- WARNING: Calculated and tabulated Q-values disagree: 225483473110.4295 eV vs 2.094743e8 eV!
27. Calculated and tabulated Q values disagree.  
*fissionComponent label 3: /reactionSuite/fissionComponents/fissionComponent[@label='3']*  
*(Error # 0): Q mismatch*
- WARNING: Calculated and tabulated Q-values disagree: 225483473110.4295 eV vs 2.094743e8 eV!
28. A covariance matrix was not positive semi-definite, so it has negative eigenvalues.  
*Section 15 (n + Cm241 [angular distribution]): / Form 'eval': / LegendreLValue L=1*  
*vs 1 (Error # 0): Bad evs*

WARNING: 10 negative eigenvalues! Worst case = -9.243089e-04

- njoy2012 Warnings:

1. Evaluation has no resonance parameters given  
*unresr...calculation of unresolved resonance cross sections (0): No RR*

```
---message from unresr---mat 9628 has no resonance parameters
      copy as is to nout
```

2. In some evaluations, the partial fission reactions MT=19, 20, 21, and 38 are given in File 3, but no corresponding distributions are given. In these cases, it is assumed that MT=18 should be used for the fission neutron distributions.  
*heatr...prompt kerma (0): HEATR/hinit (3)*

- message from hinit---mt19 has no spectrum  
mt18 spectrum will be used.
3. Recoil is not given, so one-particle recoil approximation used.  
*heatr...prompt kerma (1): HEATR/hinit (4)*

---message from hinit---mf6, mt 16 does not give recoil za= 96240  
one-particle recoil approx. used.

  4. Recoil is not given, so one-particle recoil approximation used.  
*heatr...prompt kerma (2): HEATR/hinit (4)*

---message from hinit---mf6, mt 17 does not give recoil za= 96239  
one-particle recoil approx. used.

  5. Recoil is not given, so one-particle recoil approximation used.  
*heatr...prompt kerma (3): HEATR/hinit (4)*

---message from hinit---mf6, mt 51 does not give recoil za= 96241  
one-particle recoil approx. used.

  6. Recoil is not given, so one-particle recoil approximation used.  
*heatr...prompt kerma (4): HEATR/hinit (4)*

---message from hinit---mf6, mt 52 does not give recoil za= 96241  
one-particle recoil approx. used.

  7. Recoil is not given, so one-particle recoil approximation used.  
*heatr...prompt kerma (5): HEATR/hinit (4)*

---message from hinit---mf6, mt 53 does not give recoil za= 96241  
one-particle recoil approx. used.

  8. Recoil is not given, so one-particle recoil approximation used.  
*heatr...prompt kerma (6): HEATR/hinit (4)*

---message from hinit---mf6, mt 54 does not give recoil za= 96241  
one-particle recoil approx. used.

  9. Recoil is not given, so one-particle recoil approximation used.  
*heatr...prompt kerma (7): HEATR/hinit (4)*

---message from hinit---mf6, mt 91 does not give recoil za= 96241  
one-particle recoil approx. used.

  10. Recoil is not given, so one-particle recoil approximation used.  
*heatr...prompt kerma (8): HEATR/hinit (4)*

---message from hinit---mf6, mt102 does not give recoil za= 96242  
photon momentum recoil used.

  11. There is a problem with the fission energy release.  
*heatr...prompt kerma (17): HEATR/nheat (3)*

---message from nheat---changed q from 2.094743E+08 to 1.994929E+08  
for mt 18

12. Evaluation has no resonance parameters given  
*purrr...probabalistic unresolved calculation (0): No RR*

```
---message from purr---mat 9628 has no resonance parameters  
copy as is to nout
```

- **xsectplotter** Errors:

1. ENDF format insists that all outgoing fission neutrons, delayed or otherwise, have spectra. For delayed neutrons this is tough.  
*(Error # 2): No delayed n dist*

```
WARNING: More than one delayed fission neutron decay time but no MF = 5 data
```

2. Duplicate Eout in outgoing distribution  
*(Error # 3): Bad Eout*

```
WARNING: skipping duplicate e_out = 6969520.0, i1 = 81 0 1e-05
```